REMARKS

The present application was filed on February 20, 2002 with claims 1 through 20. Claims 1 through 20 are presently pending in the above-identified patent application. Claims 1, 7, 13, and 16 are proposed to be amended herein.

5   In the Office Action, the Examiner rejected claims 1-20 under 35 U.S.C. 101 for being directed to non-statutory subject matter. The Examiner rejected claims 1, 2, 4, 6-8, 10, 12, 13, 15-18, and 20 under 35 U.S.C. §102(e) as being anticipated by Prasanna (United States Patent Number 6,272,599 B1), and rejected claims 3 and 9 under 35 U.S.C. §103(a) as being unpatentable over Prasanna. The Examiner indicated that claims 5, 11, 14, and 19 would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

Section 101 Rejections

Claims 1-20 were rejected under 35 U.S.C. 101 for being directed to non-statutory subject matter. In particular, the Examiner asserts that, in claim 1, for example, the establishing of a bound based on said number of live frames does not provide a useful, concrete, and tangible result. The Examiner further asserts that the establishment of a bound is merely a calculation or at best, data manipulation, which is not a physical transformation, and that the transformation must be with an "article or physical object to a different state or thing." In Point 22, the Examiner asserts that the "transformation" that the Applicant highlights is not supported in the claims or specification.

Applicants note that the present disclosure teaches that

> a critical parameter of a real-time task is its maximum response time over all possible inputs. In some systems, a task scheduler allocates a processor's cycles among multiple tasks to meet their response time requirements. *Thus, the worst-case execution time of each task must be known When instruction timings or execution paths are uncertain, conservative (worst case) assumptions are often made that may **waste system capability or lead to an unnecessarily costly system**. If the resulting worst-case time-bound is loose, a task is allocated more execution time than it can possibly use, **wasting system capability and performance**.* Efficient system design thus requires methods to tightly estimate the effect of complex cache behavior. *A need therefore exists for*

methods and apparatus that evaluate the additional execution time of the primary, interrupted task attributed to any interrupts. A further need exists for methods and apparatus that establish a bound on the effect of task interference in an instruction cache shared by multiple tasks.

5   (Page 2, lines 1-12; emphasis added.)

The present disclosure also teaches that

the present invention recognizes that the eviction of blocks from a live frame by an interrupt causes a future miss that would not otherwise occur and that evictions from live frames are the only evictions that cause misses that would
10   not otherwise occur.

The present invention thus *provides a more accurate estimate of the maximum additional execution time of a task that results from servicing an interrupt during its execution.*

(Page 2, lines 20-24; emphasis added.)

15   Thus, the establishment of a bound on the execution time of an application due to

task interference in a shared instruction cache, and the establishment of a bound based on the

number of live frames are both useful, concrete, and tangible results for ***improving system***

performance. In addition, the independent claims have been amended to explicitly require

<u>wherein said bound is suitable for use in allocating processing resources</u>

20   Regarding the Examiner's assertion that the transformation must be with an

"article or physical object to a different state or thing," Applicants note that the Supreme Court

has stated that the "[t]ransformation and reduction of an article 'to a different state or thing' is the

clue to patentability of a process claim." *Gottshalk v Benson*, 409 U.S. 63, 70, 175 U.S.P.Q.

(BNA) 676 (1972). In other words, claims that require some kind of <u>transformation</u> of subject

25   matter, which has been held to <u>include intangible</u> subject matter, such as <u>data</u> or signals, that are

representative of or constitute physical activity or objects have been held to comply with Section

101. *See, for example, In re Warmerdam*, 31 U.S.P.Q.2d (BNA) 1754, 1759 n 5 (Fed. Cir. 1994)

or *In re Schrader*, 22 F.3d 290, 295, 30 U.S.P.Q.2d (BNA) 1455, 1459 n.12 (Fed. Cir. 1994).

Thus, as expressly set forth in each of the independent claims, the claimed

30   methods or system establish a bound based on a number of live frames, wherein the bound is a

bound on the execution time of an application and <u>transform</u> a number of live frames of an

application that are coexistent during execution of the application to a bound based on the

number of live frames. <u>This transformation to a bound based on the number of live frames provides a useful, concrete and tangible result.</u>

Regarding the Examiner's assertion that there is no support for the "transformation" in the claims or the specification, Applicants note that the independent claims clearly require 1) establishing a bound based on a number of live frames, wherein the bound is a bound on the execution time of an application or a bound on an effect of task interference on an application; 2) determining a number of live frames of an application that are coexistent during execution of the application; and 3) establishing a bound based on the number of live frames

Applicants submit that each of the claims 1-20 are in full compliance with 35 U.S.C. §101, and accordingly, respectfully request that the rejection under 35 U.S.C. §101 be withdrawn.

<u>Independent Claims 1, 7, 13 and 16</u>

Independent claims 1, 7, 13, and 16 were rejected under 35 U.S.C. §102(e) as being anticipated by Prasanna. Regarding claim 1, the Examiner asserts that Prasanna discloses determining a number of live frames (live when cache bit is set to 1) of said application that are coexistent during execution of said application; and establishing said bound based on said number of live frames (see, Abstract; col. 2, lines 23-58; col. 3, lines 1-30).

In the text cited by the Examiner, Prasanna teaches that

the present invention is used to customize cache-based architectures to minimize the WCET of different applications by adding a cache/no-cache bit to each datum, thereby permitting selective caching of data and instructions. A datum is cached only if its cache/no-cache bit is 1, otherwise when the bit is 0 the datum is left in the main system memory. The control granularity, e.g. a bit per instruction or one or more bits per block of instructions, has to be appropriately chosen as it determines the resulting WCET and can thus improve performance.
(Col. 2, lines 39-48.)

Contrary to the Examiner's assertion, Prasanna does *not* address the issue of establishing a *bound* on the *execution time of an application* or on an *effect of task interference on an application*, as required by the claims of the present invention, does not disclose or suggest *determining a number* of live frames of said application that are coexistent during

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execution of said application, and does not disclose or suggest *establishing a bound, as defined in the present claims, **based on the number of live frames*** Independent claims 1, 7, 13, and 16, as amended, require determining a number of live frames of said application that are coexistent during execution of said application; and establishing said bound based on said number of live

5   frames.

Thus, Prasanna does not disclose or suggest determining a number of live frames of said application that are coexistent during execution of said application; and establishing said bound based on said number of live frames, as required by independent claims 1, 7, 13, and 16, as amended

10   Dependent Claims 2-6, 8-12, 14-15 and 17-20

Dependent claims 2, 4, 6, 8, 10, 12, 15, 17, 18, and 20 were rejected under 35 U.S.C. §102(e) as being anticipated by Prasanna, and claims 3 and 9 were rejected under 35 U.S.C. §103(a) as being unpatentable over Prasanna
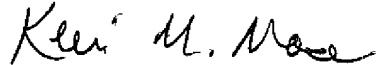
Claims 2-6, 8-12, 14-15, and 17-20 are dependent on claims 1, 7, 13, and 16,

15   respectively, and are therefore patentably distinguished over Prasanna because of their dependency from amended independent claims 1, 7, 13, and 16 for the reasons set forth above, as well as other elements these claims add in combination to their base claim

All of the pending claims, i.e., claims 1-20, are in condition for allowance and such favorable action is earnestly solicited.

20   If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

Respectfully submitted,

Date: May 8, 2007

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